USB-DIO96H/50

High-drive Digital I/O

User's Guide

Hardware Revision 2

Document Revision 9
June 2015
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About this User's Guide

What you will learn from this user's guide

This user's guide describes the Measurement Computing USB-DIO96H/50 data acquisition device and lists device specifications.

This manual covers revision 2 hardware and later

This manual covers revision 2 of the USB-DIO96H/50 hardware, which uses a 5 V power supply. Revision 1 of the USB-DIO96H/50 hardware has a 9 V power supply and daisy-chained hub. For information on revision 1 hardware, refer to www.mccdaq.com/pdfs/manuals/USB-DIO96H-50_R1.pdf.

Conventions in this user's guide

For more information

Text presented in a box signifies additional information related to the subject matter.

Caution!	Shaded caution statements present information to help you avoid injuring yourself and others, damaging your hardware, or losing your data.
bold text	**Bold** text is used for the names of objects on a screen, such as buttons, text boxes, and check boxes.
italic text	*Italic* text is used for the names of manuals and help topic titles, and to emphasize a word or phrase.

Where to find more information

Additional information about the USB-DIO96H/50 is available on our website at www.mccdaq.com. You can also contact Measurement Computing Corporation by phone, fax, or email with specific questions.

- Knowledgebase: kb.mccdaq.com
- Tech support form: www.mccdaq.com/support/support_form.aspx
- Email: techsupport@mccdaq.com
- Phone: 508-946-5100 and follow the instructions for reaching Tech Support

Introducing the USB-DIO96H/50

The USB-DIO96H/50 is supported under popular Microsoft® Windows® operating systems. The USB-DIO96H/50 is fully compatible with both USB 1.1 and USB 2.0 ports.

The USB-DIO96H/50 provides 96 digital I/O lines, high output current.

The 96 digital I/O lines are accessed through two 50-pin connectors. Each digital port group is divided into two 8-bit ports and two 4-bit ports, and is a discrete emulation of 82C55 mode zero operation. You can configure each port independently for either input or output.

The USB-DIO96H/50 outputs are high-drive TTL that can source 24 mA and sink 64 mA. Additional buffering is typically not required to drive external devices.

Each digital port has associated DIP switches to drive the ports high during power up and reset. You can optionally set these switches for a pull-down configuration. All I/O bits are set to input mode on power up and reset.

The USB-DIO96H/50 is shipped in a rugged metal enclosure that you can mount on a DIN rail or on a bench (refer to Figure 9 on page 14).

The USB-DIO96H/50 is powered by an external +5 V regulated power supply that is shipped with the board. A jumper-selectable Molex® connector is also available inside the case if you need an alternate power supply (the cable for this connector is not included).

This manual covers revision 2 hardware and later

This manual covers revision 2 of the USB-DIO96H/50 hardware, which uses a 5 V power supply. Revision 1 of the USB-DIO96H/50 hardware has a 9 V power supply and daisy-chained hub. For information on revision 1 hardware, refer to www.mccdaq.com/PDFs/Manuals/USB-DIO96H-50_R1.pdf.

USB-DIO96H/50 block diagram

USB-DIO96H/50 functions are illustrated in the block diagram shown here.

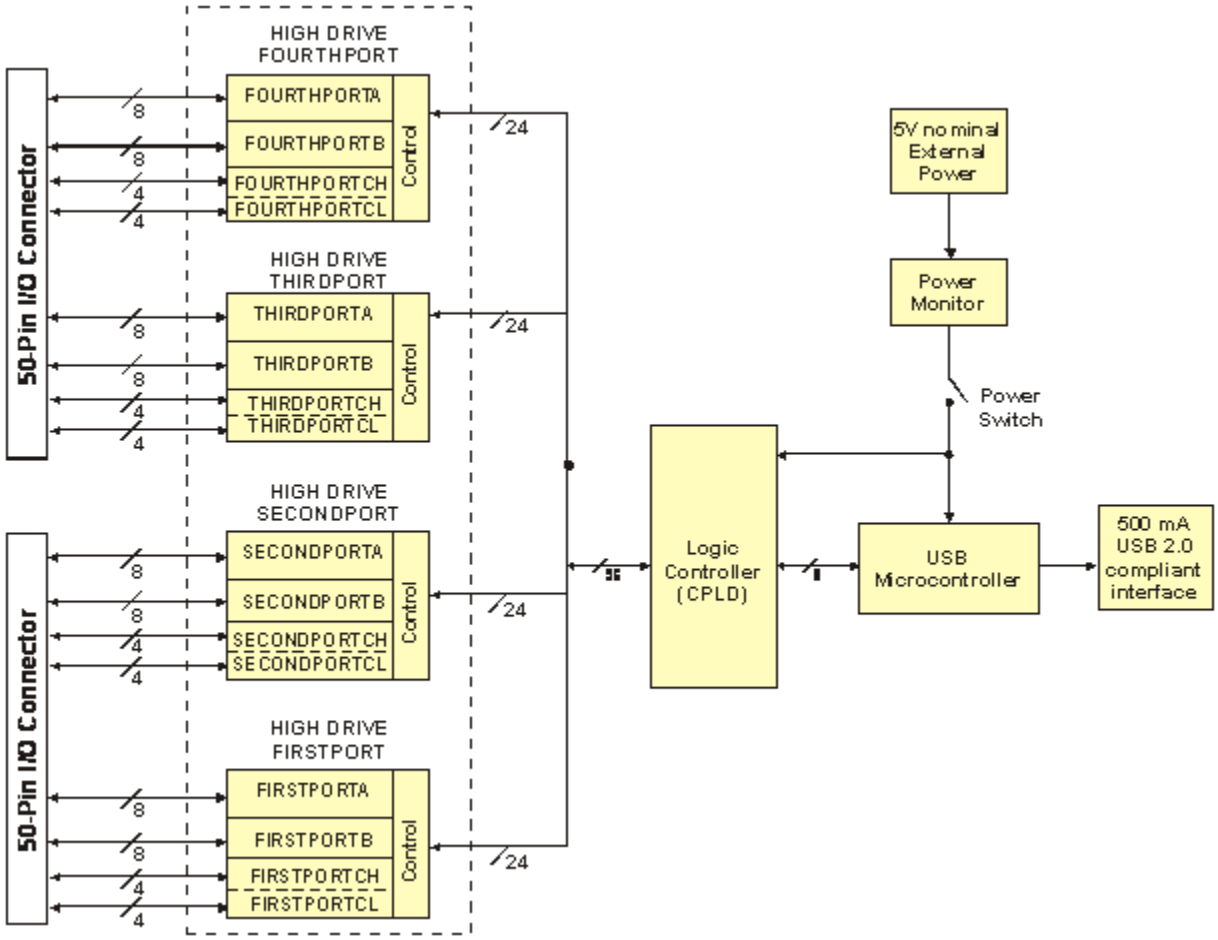


Figure 1. USB-DIO96H/50 functional block diagram

Installing the USB-DIO96H/50

Unpacking

As with any electronic device, you should take care while handling to avoid damage from static electricity. Before removing the device from its packaging, ground yourself using a wrist strap or by simply touching the computer chassis or other grounded object to eliminate any stored static charge.

Contact us immediately if any components are missing or damaged.

Installing the software

Refer to the MCC DAQ Quick Start for instructions on installing the software on the MCC DAQ CD. Refer to the device product page on the Measurement Computing website for information about the included and optional software supported by the USB-DIO96H/50.

Install the software before you install your device

The driver needed to run the USB-DIO96H/50 is installed with the software. Therefore, you need to install the software package you plan to use before you install the device.

Installing the hardware

Before you connect the USB-DIO96H/50 to your computer, connect the external power supply that is shipped with the device.

Connecting the external power supply

Power to the USB-DIO96H/50 is provided with the +5 V external power supply (PS-5V3AEPS). You must connect the external power supply *before* connecting the USB cable to the USB-DIO96H/50 and your computer.

To connect the power supply to the USB-DIO96H/50, connect the external power cord to the power connector labeled **POWER IN** on the USB-DIO96H/50 enclosure (**P5** on the board). Refer to Figure 3 on page 11 for the location of this connector.

The **PWR** LED lights up when +5 V power is supplied to the USB-DIO96H/50. If the voltage supply is less than +4.1 V or more than +5.6 V, the **PWR** LED does not light.

Connecting the USB-DIO96H/50 to your system

To connect the USB-DIO96H/50 to your system, connect the USB cable to a USB port on your computer or to an external USB hub that is connected to your computer.

When you connect the device for the first time, multiple **Found New Hardware** dialogs open when the operating system detects the device. When installation is complete, the **USB LED** blinks and remains on. This indicates that communication is established between the device and the computer.

If the USB LED turns off

If the USB LED turns on but then turns off, the computer has lost communication with the USB-DIO96H/50. To restore communication, disconnect the USB cable from the computer, and then reconnect it. This should restore communication, and the USB LED should turn back *on*.

Caution! Do not disconnect any device from the USB bus while the computer is communicating with the USB-DIO96H/50, or you may lose data and/or your ability to communicate with the USB-DIO96H/50.

If your system does not detect the USB-DIO96H/50

Perform the following procedure if a **USB device not recognized** message displays when you connect the USB-DIO96H/50:

1. Unplug the USB cable from the USB-DIO96H/50.
2. Unplug the external power cord from the **POWER IN** connector on the enclosure.
3. Plug the external power cord back into the **POWER IN** connector.
4. Plug the USB cable back into the USB-DIO96H/50.

Your system should now properly detect the USB-DIO96H/50 hardware. Contact technical support if your system still does not detect the USB-DIO96H/50.

Signal connections

The table below lists the board connectors, applicable cables, and compatible accessory boards.

Board connectors, cables, accessory equipment

Connector (P1 and P2)	50-pin 0.1" IDC type box header	
Compatible cables	C50FF-x, 50-pin ribbon cable. x = 3 or 6 feet (Figure 2)	
Compatible accessory products	SCB-50 CIO-MINI50 (2) CIO-TERM100 CIO-SPADE50 (2) CIO-ERB24	CIO-SERB24/FD CIO-ERB48 CIO-SERB48 SSR-RACK24 SSR-RACK48

P1 pinout

50-pin connector pinout (P1)

Signal name	Pin		Pin	Signal name
GND	50	• •	49	+5V
FIRSTPORTC Bit 0	48	• •	47	FIRSTPORTC Bit 1
FIRSTPORTC Bit 2	46	• •	45	FIRSTPORTC Bit 3
FIRSTPORTC Bit 4	44	• •	43	FIRSTPORTC Bit 5
FIRSTPORTC Bit 6	42	• •	41	FIRSTPORTC Bit 7
FIRSTPORTB Bit 0	40	• •	39	FIRSTPORTB Bit 1
FIRSTPORTB Bit 2	38	• •	37	FIRSTPORTB Bit 3
FIRSTPORTB Bit 4	36	• •	35	FIRSTPORTB Bit 5
FIRSTPORTB Bit 6	34	• •	33	FIRSTPORTB Bit 7
FIRSTPORTA Bit 0	32	• •	31	FIRSTPORTA Bit 1
FIRSTPORTA Bit 2	30	• •	29	FIRSTPORTA Bit 3
FIRSTPORTA Bit 4	28	• •	27	FIRSTPORTA Bit 5
FIRSTPORTA Bit 6	26	• •	25	FIRSTPORTA Bit 7
SECONDPORTC Bit 0	24	• •	23	SECONDPORTC Bit 1
SECONDPORTC Bit 2	22	• •	21	SECONDPORTC Bit 3
SECONDPORTC Bit 4	20	• •	19	SECONDPORTC Bit 5
SECONDPORTC Bit 6	18	• •	17	SECONDPORTC Bit 7
SECONDPORTB Bit 0	16	• •	15	SECONDPORTB Bit 1
SECONDPORTB Bit 2	14	• •	13	SECONDPORTB Bit 3
SECONDPORTB Bit 4	12	• •	11	SECONDPORTB Bit 5
SECONDPORTB Bit 6	10	• •	9	SECONDPORTB Bit 7
SECONDPORTA Bit 0	8	• •	7	SECONDPORTA Bit 1
SECONDPORTA Bit 2	6	• •	5	SECONDPORTA Bit 3
SECONDPORTA Bit 4	4	• •	3	SECONDPORTA Bit 5
SECONDPORTA Bit 6	2	• •	1	SECONDPORTA Bit 7

P2 pinout

50-pin connector pin out (P2)

Signal name	Pin		Pin	Signal name
GND	100	• • •	99	+5V
THIRDPORTC Bit 0	98	• •	97	THIRDPORTC Bit 1
THIRDPORTC Bit 2	96	• •	95	THIRDPORTC Bit 3
THIRDPORTC Bit 4	94	• •	93	THIRDPORTC Bit 5
THIRDPORTC Bit 6	92	• •	91	THIRDPORTC Bit 7
THIRDPORTB Bit 0	90	• •	89	THIRDPORTB Bit 1
THIRDPORTB Bit 2	88	• •	87	THIRDPORTB Bit 3
THIRDPORTB Bit 4	86	• •	85	THIRDPORTB Bit 5
THIRDPORTB Bit 6	84	• •	83	THIRDPORTB Bit 7
THIRDPORTA Bit 0	82	• •	81	THIRDPORTA Bit 1
THIRDPORTA Bit 2	80	• •	79	THIRDPORTA Bit 3
THIRDPORTA Bit 4	78	• •	77	THIRDPORTA Bit 5
THIRDPORTA Bit 6	76	• •	75	THIRDPORTA Bit 7
FOURTHPORTC Bit 0	74	• •	73	FOURTHPORTC Bit 1
FOURTHPORTC Bit 2	72	• •	71	FOURTHPORTC Bit 3
FOURTHPORTC Bit 4	70	• •	69	FOURTHPORTC Bit 5
FOURTHPORTC Bit 6	68	• •	67	FOURTHPORTC Bit 7
FOURTHPORTB Bit 0	66	• •	65	FOURTHPORTB Bit 1
FOURTHPORTB Bit 2	64	• •	63	FOURTHPORTB Bit 3
FOURTHPORTB Bit 4	62	• •	61	FOURTHPORTB Bit 5
FOURTHPORTB Bit 6	60	• •	59	FOURTHPORTB Bit 7
FOURTHPORTA Bit 0	58	• •	57	FOURTHPORTA Bit 1
FOURTHPORTA Bit 2	56	• •	55	FOURTHPORTA Bit 3
FOURTHPORTA Bit 4	54	• •	53	FOURTHPORTA Bit 5
FOURTHPORTA Bit 6	52	• •	51	FOURTHPORTA Bit 7

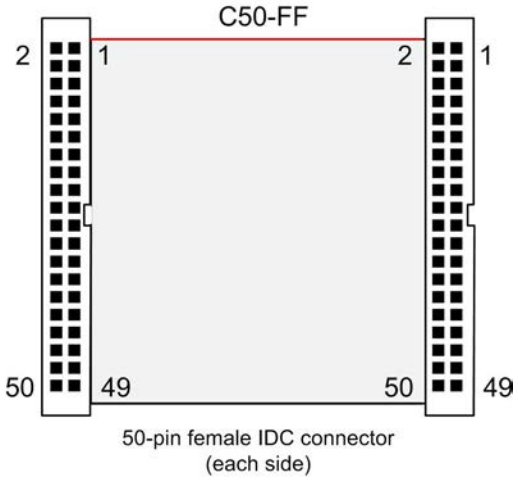


Figure 2. C50FF-x cable

Field wiring and signal conditioning

Details on the following compatible field wiring products are available on our web site at www.mccdaq.com/products/screw_terminal_bnc.aspx:

- CIO-MINI50 – 50-pin screw terminal board.
- CIO-TERM100 – 100-pin screw terminal board (two 50-pin IDC connectors).
- CIO-SPADE50 — 16" × 4" termination panel which mates with both 37-pin and 50-pin connectors.
- SCB-50 – 50-conductor, shielded signal connection box.

Details on the following compatible signal conditioning products are available on our web site at www.mccdaq.com/products/signal_conditioning.aspx:

- CIO-ERB24 – 24 Form C relays, 6 amp relay accessory board for digital signal conditioning.
- CIO-SERB24/FD – 24 Form C relays, 10 amp, fault detecting relay accessory board with socketed and field-replaceable relays.
- CIO-ERB48 – 48 Form C relays, 6 amp, relay, 50-pin accessory board for digital signal conditioning.
- CIO-SERB48 – 24 Form C relays, 10 amp relay accessory board with socketed and field-replaceable relays.
- SSR-RACK24 – 24-channel solid-state relay mounting rack for digital signal conditioning.
- SSR-RACK48 – 48-channel solid-state relay mounting rack with quad-format devices.

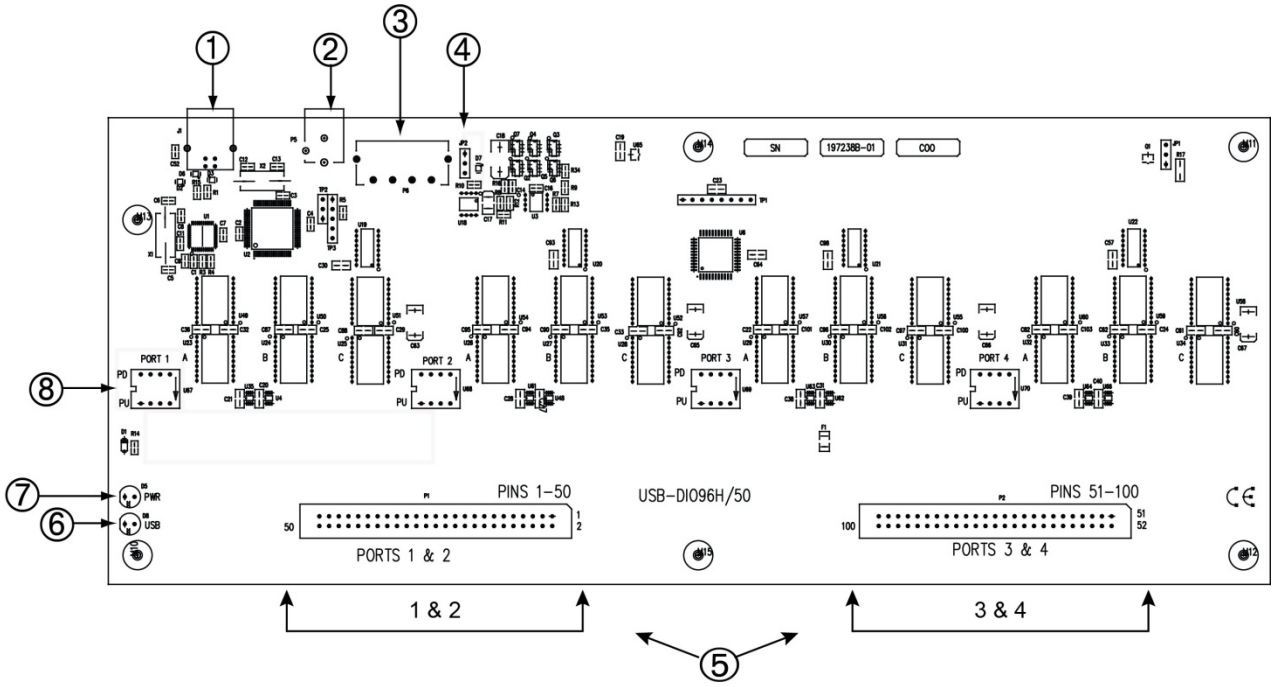
For additional information about digital interfacing

Detailed information regarding digital interfacing is contained in *Guide to DAQ Signal Connections*. This document is available on our web site at www.measurementcomputing.com/signals/signals.pdf.

Functional Details

Internal components

The USB-DIO96H/50 components are shown in Figure 3.



1	USB IN connector	5	Ports 1 through 4 (two 50-pin connectors)
2	External power connector (**POWER IN)**	6	**USB** LED
3	Molex connector (P6)	7	**PWR** LED
4	Power source jumper (JP2)	8	Pull-up/down DIP switches

Figure 3. USB-DIO96H/50 components

USB connector

Connect the supplied USB cable between the device and the USB port on the computer (or USB hub connected to the computer). This connector is labeled **USB IN** on the enclosure and **J1** on the board.

External power connector

The external power connector is labeled **POWER IN** on the enclosure and **P5** on the board. Connect the **POWER IN** connector to the supplied +5 V external power supply (PS-5V3AEPS). When running at full load, the device draws 2.6 A from the supply.

Molex connector

The internal Molex connector is labeled **P6** on the board. Remove the device enclosure to access this connector.

Internal power connector pinout

Pin 1	5V
Pin 2	GND
Pin 3	GND
Pin 4	NC (no connect)

Pin 1 (5 V) of the Molex connector is directly to the left of the power source jumper (JP2).

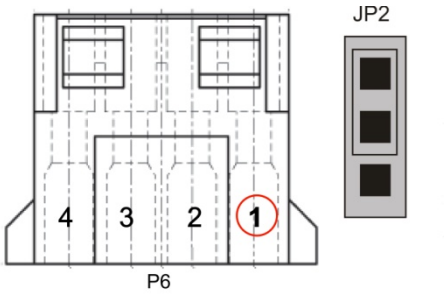


Figure 4. Molex connector (P6) pin assignments

Power source jumper JP2

The power source jumper is labeled **JP2** on the board. Use this jumper to configure the USB-DIO96H/50 to use either the external power connector (**POWER IN**) or the internal Molex connector. Figure 6 shows the jumper in each configuration mode.

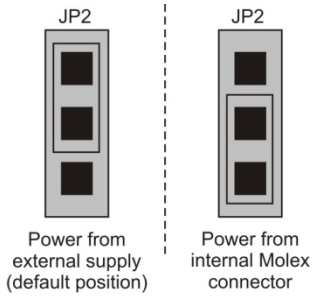


Figure 5. JP2 configuration modes

USB LED

The **USB** LED indicates the communication status of the USB-DIO96H/50. It uses up to 5 mA of current and cannot be disabled. The table below explains the function of the **USB** LED.

USB LED illumination

LED Illumination	Indication
Steady green	The USB-DIO96H/50 is connected to a computer or external USB hub.
Continuous blink	Initial communication is established between the device and the computer, or data is being transferred.

PWR LED

The **PWR** LED illuminates when external power is supplied. The USB-DIO96H/50 incorporates an on-board voltage supervisory circuit that monitors the external power supply. The **PWR** LED does not light under the following circumstances:

- when the input power falls below +4.1 V
- when the input power goes above +5.6 V

50-pin header connectors

The USB-DIO96H/50 has two 50-pin connectors labeled **P1** and **P2**.

Connector P1 provides the following connections:

- 48 DIO connections (**FIRSTPORTA Bit 0** through **SECONDPORTC Bit 7**)
- one ground connection (**GND**)
- one power connection (**+5V**)

Connector P2 provides the following connections:

- 48 DIO connections (**THIRDPORTA Bit 0** through **FOURTHPORTC Bit 7**)
- one ground connection (**GND**)
- one power connection (**+5V**)

Each digital port group is divided into two 8-bit ports and two 4-bit ports, and is a discrete emulation of 82C55 mode zero operation. You can configure each port independently for either input or output.

Pull-up/pull-down DIP switches

Use the on-board DIP switches labeled **PORT 1** through **PORT 4** to configure the pull-up/down configuration for each port. Each set of DIP switches includes four switches labeled 1 to 4. Switch 1 controls PORTA, switch 2 controls PORTB, switch 3 controls PORTCL, and switch 4 controls PORTCH. Figure 7 shows the DIP switches used to configure Port 1.

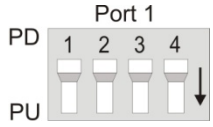


Figure 6. Pull-up/down switch configuration

All DIP switches are configured by default for pull-up (**PU**). To configure for pull-down slide the switch to the **PD** position.

Mechanical drawings

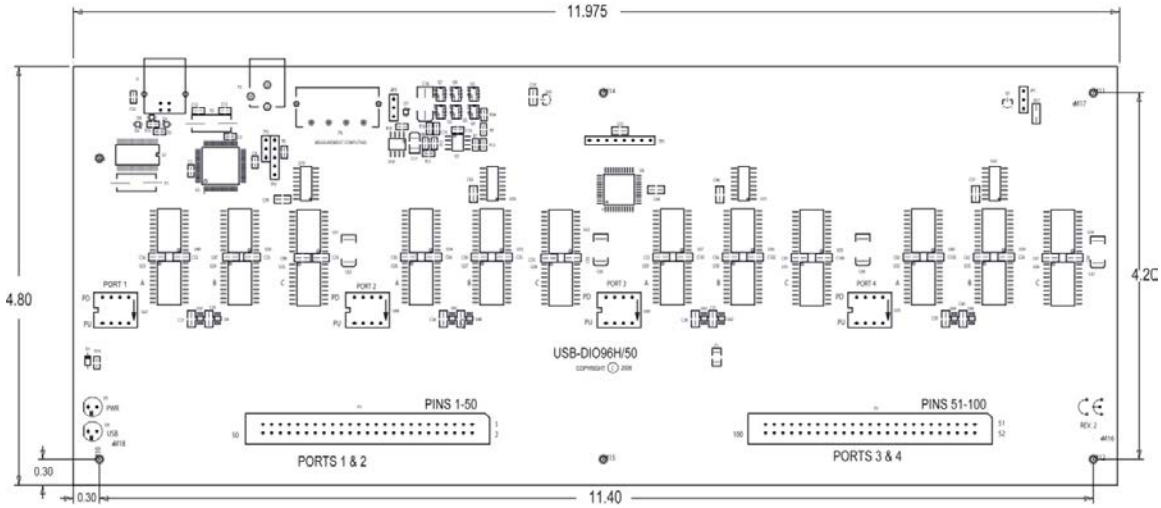


Figure 7. Circuit board dimensions

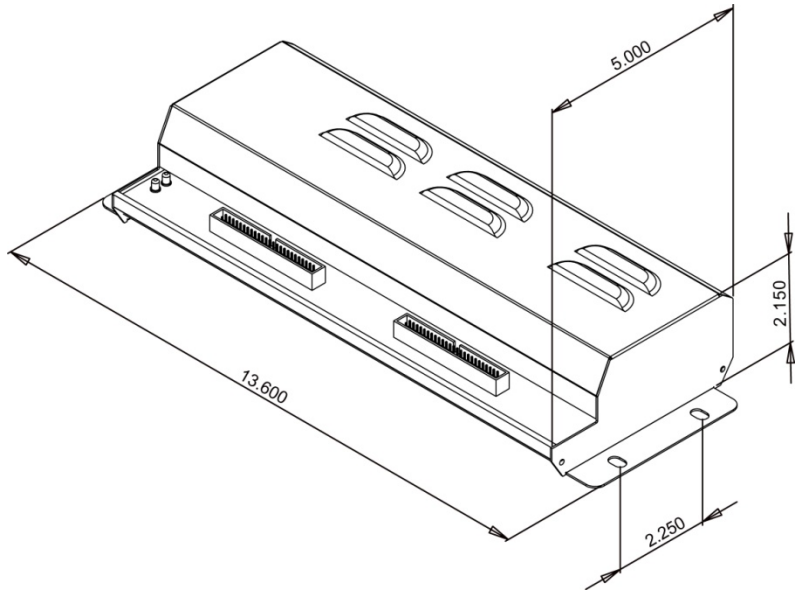


Figure 8. Enclosure dimensions

Specifications

This specification applies to revision 2 hardware and later

This specification covers revision 2 of the USB-DIO96H/50 hardware, which uses a 5 V power supply. Revision 1 of the USB-DIO96H/50 hardware was designed with a 9 V power supply and daisy chained hub. For revision 1 hardware specifications, refer to www.mccdaq.com/PDFs/Manuals/USB-DIO96H-50_R1.pdf.

All specifications are subject to change without notice.
Typical for 25 °C unless otherwise specified.
Specifications in *italic text* are guaranteed by design.

Digital input/output

Table 1. Digital I/O specifications

Parameter	Specification
Output	74ABT244A
Input	74ACT373
Configuration	Eight banks of 8, eight banks of 4, programmable by bank as input or output
Pull-up/pull-down	High impedance pull-up/pull-down selectable via DIP switch for each digital input port.
Number of I/O	96
Output high	2.0 V min @ –24 mA
Output low	0.5 V max @ 64 mA
Input high	2.0 V min, 5.5 V max
Input low	0.8 V max, –0.5 V absolute min
Input impedance	47 kΩ (series resistance)
Source current	24 mA per output max
Sink current	64 mA per output max
Power up state	Input mode
Debounce mode	Debouncing option available through firmware that samples all inputs eight times over a specified interval and latches out the input state only when eight consecutive samples are identical (all 0s or all 1s). Available debouncing intervals are 1 ms, 2 ms, 5 ms, 10 ms, 20 ms, 50 ms, 100 ms, 200 ms, and 400 ms.
Debounce interval accuracy	+0% / –12.5%

Power

Table 2. Power specifications

Parameter	Conditions	Specification
USB +5 V input voltage range		4.75 V min to 5.25 V max
USB +5 V supply current	All modes of operation	<100 mA
External power input (Note 1)		5 VDC ± 5% (5 VDC power supply provided)
External power supply (included)	MCC p/n PS-5V3AEPS	5 VDC, 15 W, 5% regulation
Alternate external power supply	From PC auxiliary power (cable not included)	Jumper selectable Molex® connector internal to case
Voltage supervisor limits	4.13 V > V_{ext} or V_{ext} > 5.59 V	PWR LED = Off (power fault)
	4.13 V < V_{ext} < 5.59 V	PWR LED = On
Power supply current		2.7 A max
User 5 V output voltage range	Available at +5 V pins	4.0 V min, 5.25 V max
User 5 V output current available	Total from all +5 V pins	50 mA max

Note 1: Voltage specification applies at barrel plug power input. The power supply provided with the board meets this specification at the rated total power supply current. If a different power supply is used, small line resistances could cause significant voltage drop between the power supply and the barrel plug input.

Environmental

Table 3. Environmental specifications

Parameter	Specification
Operating temperature range	*0 °C to 60 °C*
Storage temperature range	*–40 °C to 85 °C*
Humidity	*0% to 90% non-condensing*

USB specifications

Table 4. USB specifications

Parameter	Specification
USB "B" connector	Input
USB device type	USB 2.0 (full-speed)
Device compatibility	USB 1.1, USB 2.0
USB cable type	*A-B cable, UL type AWM 2527 or equivalent. (min 24 AWG VBUS/GND, min 28 AWG D+/D–)*
USB cable length	3 m (9.84 ft) max

Data transfer rates

Table 5. Data transfer rate specifications

Parameter	Specification
Digital I/O transfer rates (software paced)	System-dependent, 33 to 250 port reads/writes or single bit reads/writes per second typ

Mechanical

Table 6. Mechanical specifications

Parameter	Specification
Card dimensions	304.8 × 121.9 × 20.0 mm (12.0 × 4.8 × 0.8 in.)
Enclosure dimensions	342.9 × 125.7 × 58.9 mm (13.50 × 4.95 × 2.32 in.)

Signal connectors

Table 7. Ribbon connector specifications

Parameter	Specification
Connectors	P1-P2: 50-pin 0.1" IDC type box header
Compatible cables	C-50FF-x 50-pin ribbon cable
Compatible accessory products	SCB-50 CIO-MINI50 (2) CIO-TERM100 CIO-SPADE50 (2) CIO-ERB24 CIO-SERB24/FD CIO-ERB48 CIO-SERB48 SSR-RACK24 SSR-RACK48

P1

Table 8. P1 pinout

Pin	Signal name	Pin	Signal name
50	GND	49	+5V
48	FIRSTPORTC Bit 0	47	FIRSTPORTC Bit 1
46	FIRSTPORTC Bit 2	45	FIRSTPORTC Bit 3
44	FIRSTPORTC Bit 4	43	FIRSTPORTC Bit 5
42	FIRSTPORTC Bit 6	41	FIRSTPORTC Bit 7
40	FIRSTPORTB Bit 0	39	FIRSTPORTB Bit 1
38	FIRSTPORTB Bit 2	37	FIRSTPORTB Bit 3
36	FIRSTPORTB Bit 4	35	FIRSTPORTB Bit 5
34	FIRSTPORTB Bit 6	33	FIRSTPORTB Bit 7
32	FIRSTPORTA Bit 0	31	FIRSTPORTA Bit 1
30	FIRSTPORTA Bit 2	29	FIRSTPORTA Bit 3
28	FIRSTPORTA Bit 4	27	FIRSTPORTA Bit 5
26	FIRSTPORTA Bit 6	25	FIRSTPORTA Bit 7
24	SECONDPORTC Bit 0	23	SECONDPORTC Bit 1
22	SECONDPORTC Bit 2	21	SECONDPORTC Bit 3
20	SECONDPORTC Bit 4	19	SECONDPORTC Bit 5
18	SECONDPORTC Bit 6	17	SECONDPORTC Bit 7
16	SECONDPORTB Bit 0	15	SECONDPORTB Bit 1
14	SECONDPORTB Bit 2	13	SECONDPORTB Bit 3
12	SECONDPORTB Bit 4	11	SECONDPORTB Bit 5
10	SECONDPORTB Bit 6	9	SECONDPORTB Bit 7
8	SECONDPORTA Bit 0	7	SECONDPORTA Bit 1
6	SECONDPORTA Bit 2	5	SECONDPORTA Bit 3
4	SECONDPORTA Bit 4	3	SECONDPORTA Bit 5
2	SECONDPORTA Bit 6	1	SECONDPORTA Bit 7

P2

Table 9. P2 pinout

Pin	Signal name	Pin	Signal name
100	GND	99	+5V
98	THIRDPORTC Bit 0	97	THIRDPORTC Bit 1
96	THIRDPORTC Bit 2	95	THIRDPORTC Bit 3
94	THIRDPORTC Bit 4	93	THIRDPORTC Bit 5
92	THIRDPORTC Bit 6	91	THIRDPORTC Bit 7
90	THIRDPORTB Bit 0	89	THIRDPORTB Bit 1
88	THIRDPORTB Bit 2	87	THIRDPORTB Bit 3
86	THIRDPORTB Bit 4	85	THIRDPORTB Bit 5
84	THIRDPORTB Bit 6	83	THIRDPORTB Bit 7
82	THIRDPORTA Bit 0	81	THIRDPORTA Bit 1
80	THIRDPORTA Bit 2	79	THIRDPORTA Bit 3
78	THIRDPORTA Bit 4	77	THIRDPORTA Bit 5
76	THIRDPORTA Bit 6	75	THIRDPORTA Bit 7
74	FOURTHPORTC Bit 0	73	FOURTHPORTC Bit 1
72	FOURTHPORTC Bit 2	71	FOURTHPORTC Bit 3
70	FOURTHPORTC Bit 4	69	FOURTHPORTC Bit 5
68	FOURTHPORTC Bit 6	67	FOURTHPORTC Bit 7
66	FOURTHPORTB Bit 0	65	FOURTHPORTB Bit 1
64	FOURTHPORTB Bit 2	63	FOURTHPORTB Bit 3
62	FOURTHPORTB Bit 4	61	FOURTHPORTB Bit 5
60	FOURTHPORTB Bit 6	59	FOURTHPORTB Bit 7
58	FOURTHPORTA Bit 0	57	FOURTHPORTA Bit 1
56	FOURTHPORTA Bit 2	55	FOURTHPORTA Bit 3
54	FOURTHPORTA Bit 4	53	FOURTHPORTA Bit 5
52	FOURTHPORTA Bit 6	51	FOURTHPORTA Bit 7

CE Declaration of Conformity

Manufacturer:	Measurement Computing Corporation
Address:	10 Commerce Way Suite 1008 Norton, MA 02766 USA
Category:	Electrical equipment for measurement, control and laboratory use.

Measurement Computing Corporation declares under sole responsibility that the product

USB-DIO96H/50

EU EMC Directive 89/336/EEC: Electromagnetic Compatibility, EN 61326 (1997) Amendment 1 (1998)

Emissions: Group 1, Class A

- EN 55011 (1990)/CISPR 11: Radiated and Conducted emissions.

Immunity: EN61326, Annex A

- IEC 61000-4-2 (1995): Electrostatic Discharge immunity, Criteria C.
- IEC 61000-4-3 (1995): Radiated Electromagnetic Field immunity Criteria A.
- IEC 61000-4-4 (1995): Electric Fast Transient Burst immunity Criteria B.
- IEC 61000-4-5 (1995): Surge immunity Criteria B.
- IEC 61000-4-6 (1996): Radio Frequency Common Mode immunity Criteria A.
- IEC 61000-4-8 (1994): Power Frequency Magnetic Field immunity Criteria A.
- IEC 61000-4-11 (1994): Voltage Dip and Interrupt immunity Criteria A.

Declaration of Conformity based on tests conducted by Chomerics Test Services, Woburn, MA 01801, USA in June, 2007. Test records are outlined in Chomerics Test Report # EMI4813.07.

We hereby declare that the equipment specified conforms to the above Directives and Standards.

Carl Haapaoja, Director of Quality Assurance

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